Q&A

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Questions?
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Is K Special?

Can you tell me more about potassium (K) fertilization? I have read that it is good to apply in the fall for cold tolerance and summer application can help with drought tolerant.
North Carolina

Due to the 2007 drought in the Southeast any way to improve drought tolerance of turf was considered. And this time of year managers with bermudagrass are wondering how well their grass fared following the low winter temperatures. Application of fertilizer containing K (third ingredient listed on fertilizer label) is a cultural practice that has been suggested to turf growers to increase tolerance to stresses such as those caused by drought, winter temperatures, and diseases. So, perhaps it would be beneficial to review some of the previous research on K application, particularly as it relates to K rates.

A number of soil and turf scientists have spent years studying K and its influence on turf growth and health. Plant pathologists have also suggested there are positive benefits to K applications. Much of this research is complementary in terms of concepts and rates, despite the fact that all researchers do not agree how to use this information.

One premise behind using elevated K application rates is that high sand content in rootzones of athletic fields favors K loss through leaching during the long growing season in the southeastern US. Thus, efficiency of utilization of applied K is thought to be relatively low. Because K taken up by bermudagrass remains primarily in aboveground shoot tissue, much of it is removed when the turf is mowed and clippings are removed. Therefore, high K rates, or frequent K applications, may be necessary to maintain adequate K in turfgrasses. Rates of application of K required to maintain adequate tissue K concentrations depend on soil type, fertility status, and N rate.

About 15 years ago, I initiated a series of studies to evaluate the influence of K rates on drought and cold tolerance of Tifway bermudagrass. These were field studies evaluated over a 3-year period. Potassium chloride and potassium sulfate were applied at a number of N:K ratios with K rates from 0 to 8 pounds of K per 1000 square feet each month during the growing season. Note that I am reporting K rates, not K_2O (K x 1.2 = K_20) as indicated on a bag of fertilizer.

A common question is how much K is needed to provide sufficient K in turfgrass? One way to judge sufficiency is to evaluate how much K needs to be applied to maximize K concentration in the plant. As more and more K fertilizer is applied, more can be extracted from the soil. But this relationship does not hold in the plant. The maximum leaf tissue K concentration in Tifway was approximately 1.3% in my studies. This maximum concentration was reached with about 1.6 pounds of K per 1000 square feet. These maximums were reached with a 1 to 1 down to a 1 to 0.5 N:K ratio depending on soil and N rate.

At these K application rates, the soil had 50 to 90 pounds K per acre (Mehlich-1 extractable K). This amount would generally be considered in the low to medium range of most soil tests. This illustrates that soil test recommendations may not be well calibrated. I cannot remember seeing many soil tests in the Southeast that indicated potassium was "high" or "very high," regardless of fertilization practices.

So why do researchers and extensions specialists continue to encourage high K rates when applications of K do not usually cause differences in turfgrass color and growth? It is my opinion that we view K fertilizer as insurance. Soils often have a poor retention of K, so regular applications and/or elevated rates may be necessary to maintain adequate K in turfgrasses. Potassium has never been classified as an "element of impairment." Since, it is not considered an environmental pollutant we are not as concerned about it leaching compared to nitrogen or phosphorus.

Also, benefit may be realized that is not related to darker green color. In our study drought tolerance was measured using a single application of K fertilizer at rates from 0 to 2 pounds K per 1000 square feet. Under conditions of low soil K concentration (around 15 pounds per acre in this example) K fertilization can have a significant impact on the plant's ability to prevent leaf tissue damage brought on by drought. Plants that received K rates of 1 or 2 pounds per 1000 square feet were able to recover from drought stress more quickly than plants not receiving K. In this study there were no benefits of using the 2 pound rate. In other words, the 1 pound of K was sufficient to get a positive response and the 2 pound rate was no better.

The difficult aspect is determining how much K to apply and when to apply it. Because of limitations of the soil in retaining K, applications of K with frequencies similar to nitrogen are reasonable. You want the K in the plant before the plant is stressed. As for rates, most research suggests that an application rate based on a ratio to nitrogen is appropriate. Research suggests benefit to apply at least half as much K as nitrogen, with decreasing gains once you apply more K than nitrogen. So, somewhere within that range seems justified. ■